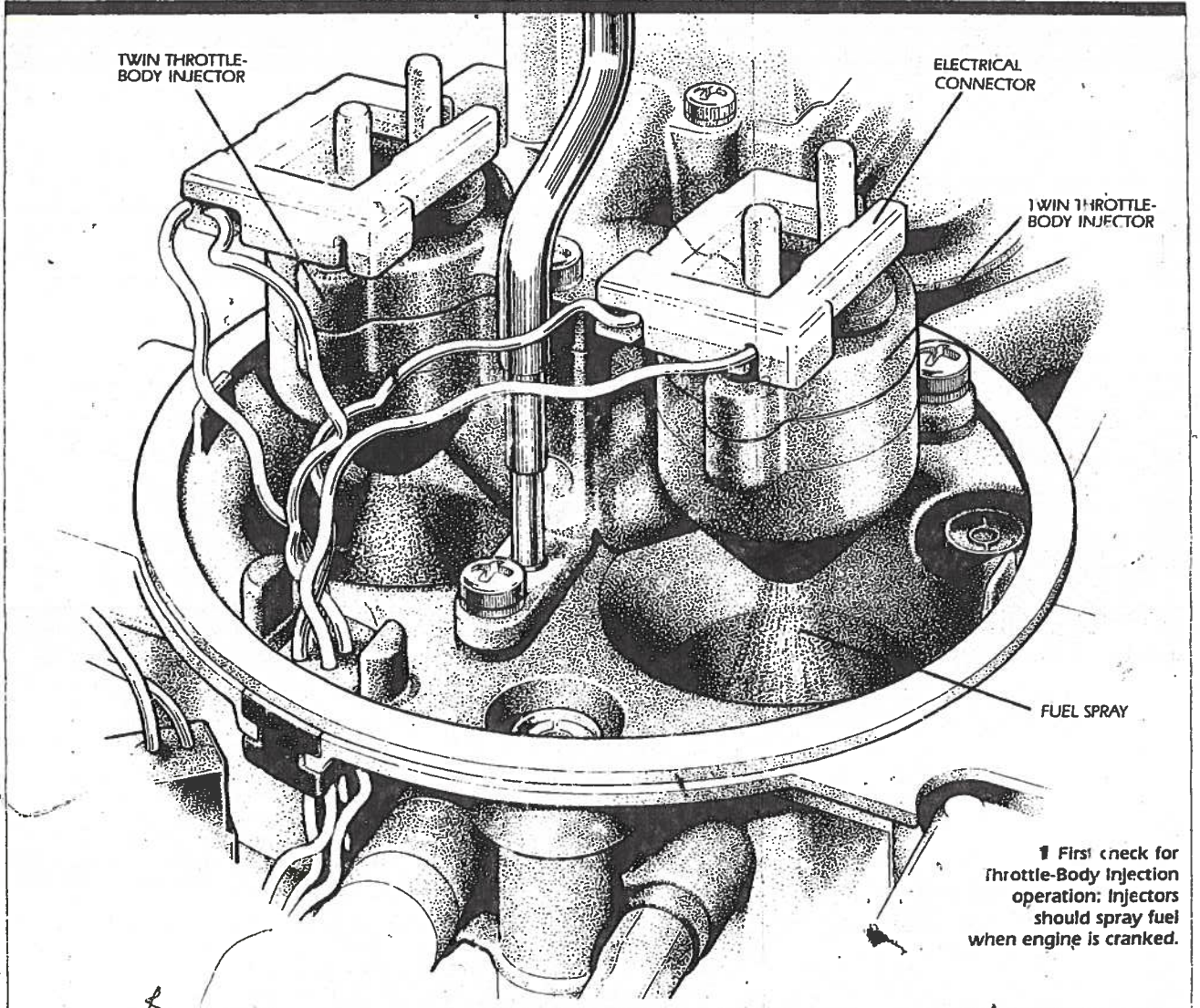


1 First check for throttle-body injection operation: injectors should spray fuel when engine is cranked.

WHEN YOUR CAR WON'T START

BY PAUL STENQUIST

It seems like it only happens when you're 10 minutes late for an important appointment. You hop in your car and turn the key. Nothing. The engine turns over fine, but it won't start. What to do?

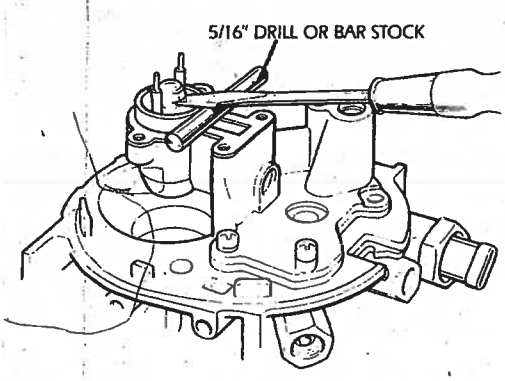
Covering the basics

Before you even pop the hood, make sure you've covered the essentials—like putting fuel in the tank and using the proper starting technique.

A fuel gauge that reads FULL doesn't always indicate a full tank. If you can't remember the last time you filled up, and the gauge is still pinned to the F mark, try pouring a few gallons of gas into the tank before you look for a more complicated problem. On many cars the fuel gauge will read FULL continuously if the sending unit isn't properly grounded.

If your engine is carbureted and the tank is empty, prime the engine by pouring a few tablespoons of gas down the carb. But reinstall the air cleaner to prevent a backfire that could start a fire. Fuel-injected engines will usually prime themselves if the key is left in the ON position for a few seconds.

Improper starting techniques can also leave you with a no-start, particularly in cold weather. Most carbureted cars are started by pressing the throttle to the floor, releasing it and turning the key with your foot off the throttle. On some cars two pumps are necessary



2 Use fulcrum for screwdriver to pry injector from GM throttle-body injector.

in colder weather. Most fuel-injected cars are started with your foot off the throttle—pumping does nothing. Check your owner's manual for detailed starting information.

Fuel or spark?

Two things are necessary to make any gasoline-burning engine run: fuel and spark. Once you're satisfied that the problem is not simply an empty fuel tank or incorrect starting technique, you can tell whether it's due to a lack of fuel or spark with a visual check.

Although simple in most cases, the procedure is not the same for throttle-body fuel-injected, port-injected and carbureted engines.

Throttle-body fuel-injected

Begin your routine by turning the key to the ON position and noting the CHECK ENGINE light. (The name varies, but all recently produced engines have some type of light to indicate computer system problems.) The light should be illuminated with the key in the ON position. If not, there is probably a basic power-supply problem and you should consult your factory service manual for further directions.

If the CHECK ENGINE light came on and your car has throttle-body fuel-injection, remove the air cleaner and have a helper crank the engine while you observe the fuel injectors. You should see fuel spraying from the injectors while the engine cranks (Fig. 1).

If you do see fuel spray, disconnect the injector (or injectors—some have two) and have your helper crank the engine again while you observe. If one or more of the injectors sprays while it is *disconnected*, the injector or injector seal is faulty and must be replaced. In this case, the no-start is caused by flooding, and you should remove the plugs, clean them with dry cleaning fluid or sparkplug cleaner, and crank the engine with the plugs out and the new injectors disconnected for a few seconds before attempting to start it.

If, while cranking the engine with the harness disconnected, there was not visible fuel spray—but you did see fuel spray when you cranked with it connected—the problem is not due to a lack of fuel. Proceed to *Checking for spark*.

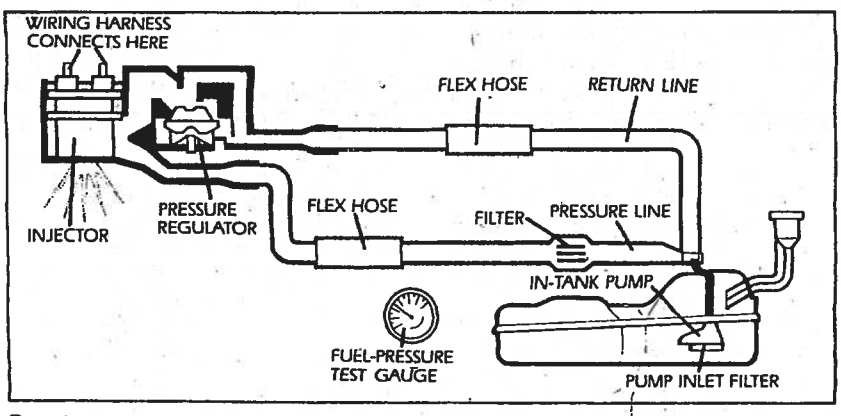
If you didn't see any fuel spray the first time you cranked the engine—with the injector harness connected—disconnect the injector harness and connect a test light across the harness connector. Special inexpensive test lights that plug into the harness are available for this purpose at auto parts stores.

Crank the engine with the test light connected. It should blink on and off, indicating that voltage is being supplied to the injector and the lack of fuel is due to either a faulty injector or a fuel-delivery problem. To determine which, turn the ignition off for at least 10 seconds and install a fuel-pressure gauge on the Schrader valve found on your engine's fuel-supply line or on the fuel-filter case.

On some cars, you'll have to use a high-pressure gauge, like the ones sold specifically for fuel-injection diagnosis. But check your manual to be sure. Some TBI systems operate at low pressure, so all that's needed is a gauge with a Schrader valve attachment.

Within a few seconds after turning the ignition on, the fuel system should pressurize. If it does, the no-start problem is due to a faulty injector(s) that should be replaced (Fig. 2).

If it doesn't pressurize, the problem is due to a bad pump, a plugged in-line or in-tank filter, a restricted fuel line or (on cars with in-tank pumps) a leaking fuel pump coupling (Fig. 3).



3 Fuel-pressure test gauge is attached at Schrader fitting (see text for location).

Port fuel injected

The procedure differs for port-injected engines because you can't see the injectors without removing them from the intake manifold.

Because of this, most manufacturers recommend that you begin troubleshooting by checking the computer's memory for trouble codes. To do this, consult the appropriate chapter in your factory service manual.

If no trouble codes are stored, skip to the section below to check for spark.

If you find that spark is okay, disconnect an injector harness connector from one of the injectors and connect a test light. As noted above, special fuel-injection test lights are sold for this purpose. Crank the engine while you watch the light.

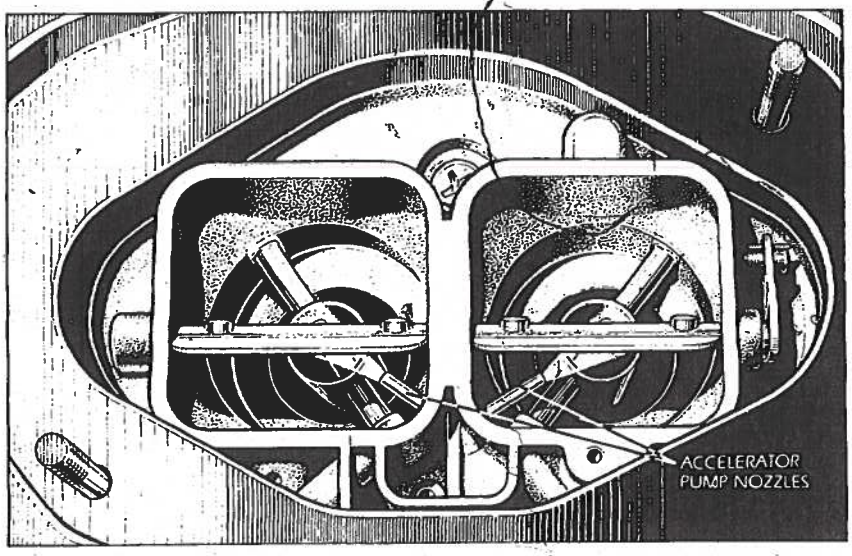
If the light blinks on and off, install a fuel-injection pressure gauge on the Schrader valve, which is probably located somewhere on the fuel rail. Turn on the ignition and note fuel pressure after the pump stops running (a few seconds in most cases). Pressure should be 30 to 40 psi on most port-injected engines. If it's not, check your service manual to make sure this spec is correct for your system. If you conclude that low fuel pressure is a problem, the cause would be comparable to TBI fuel problems mentioned earlier.

If pressure is okay, and all previous checks yielded passing grades, go to the section *Other possible problems*.

Carbureted engines

If your carbureted engine fails to start, check to see that the warning lights or CHECK ENGINE light comes on when the key is in the ON position. If it doesn't, there's a wiring problem.

If the lights come on but the engine won't start, remove the air cleaner. If the engine hasn't been running for six hours or more, the choke should be



4 Snap the throttle open and watch the carb accelerator pump nozzles for fuel spray.

almost fully closed. If it isn't, open the throttle. The choke should snap closed. If it doesn't, it's either dirty, broken or misadjusted.

If the choke seems to be working, look down into the carburetor. While holding the choke open, move the throttle rapidly to the full open position. You should see fuel squirt from the accelerator pump nozzles within the carb (Fig. 4). If you see fuel, proceed to the section *Checking for spark*.

If you don't see fuel squirt from the accelerator pump nozzles when you open the throttle, check once again to make sure there is fuel in the tank, then remove the fuel filter and check for restriction. On many cars the filter can be found behind the carburetor fuel inlet nut. Use two wrenches while removing the fuel line—one on the inlet nut, one on the fuel-line nut. It's best to use a special tubing wrench on the fuel-line nut if you have one, as this type wrench is less likely to slip on the nut. Place a rag on the manifold under the fuel-line connection before you unscrew it. There should be visible evidence of filter contamination if it's bad enough to cause a no-start.

On cars with in-line filters, place a rag under the filter and release the hose clamps that secure it in the fuel line. With this type filter it's difficult to tell if it's contaminated (unless it's see-through plastic), so you may just have to replace it to tell if it's the culprit.

If the fuel filter checks out okay, check fuel-pump capacity by connecting a hose from the fuel-inlet line to a suitable, unbreakable container. Crank the engine. The fuel pump should supply a half-pint or more of fuel in 15 seconds. If the pump can't deliver enough or delivers none at all, it should be replaced.

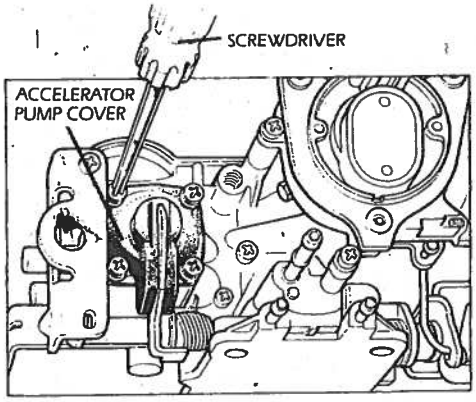
It's also possible that the line leading to the pump or the inlet sock in the tank is restricted. You can determine if either of these is the cause by filling the carb float bowl manually, starting the engine and then checking fuel-pump pressure and vacuum.

Before you remove a fuel pump, always disconnect the battery's negative cable to prevent the possibility of an electrical spark igniting any spilled fuel. When installing a new pump, make sure the pump push rod or drive cam properly contacts the pump lever.

If you found that the fuel-pump capacity was okay but there is no fuel squirting from the accelerator pump nozzles, the problem is inside the carb. On most cars, you can remove the carb air horn for basic inspection without removing the carb from the engine.

To remove the carb air horn (the upper part of the carburetor), disconnect the fuel line, throttle and choke linkage along with any other linkage rods that connect the carb base to the carb air horn.

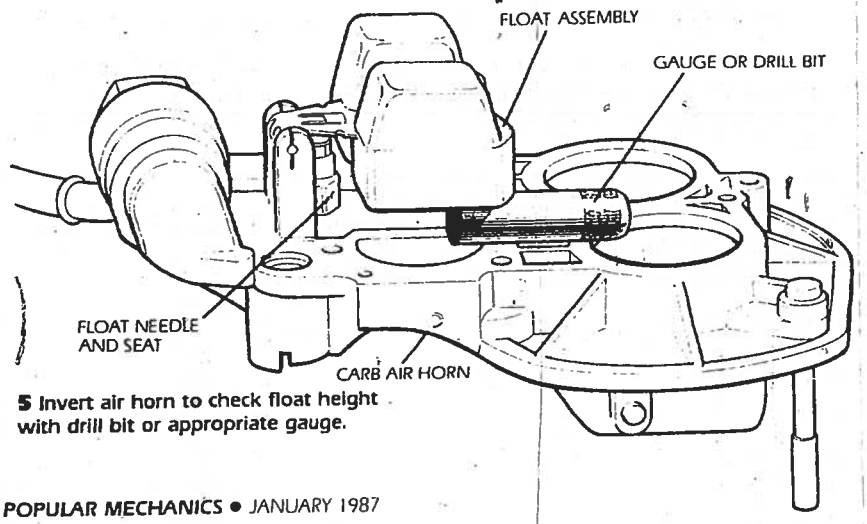
Then, being extremely careful not to drop anything into the carburetor, remove the screws that join the air horn to the float bowl; some screws may be hidden within the air horn.



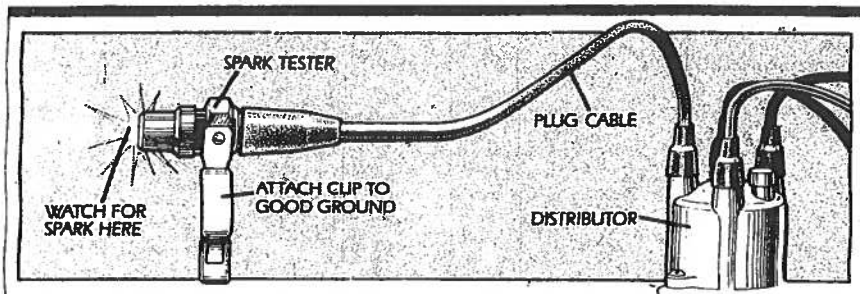
6 Remove the accelerator pump cover to check for a torn or leaky diaphragm.

Once all of the screws are removed, you should be able to carefully lift the air horn off the carb base. The float assembly, and in some cases the accelerator pump, will come off with the air horn. Turn the air horn upside down so that the float is facing you.

The float, needle and seat control the amount of fuel flowing into the carb. When the carb fuel bowl is full, the float rises and pushes the needle into its seat, preventing any more fuel from entering the float bowl until some of it is burned in the engine. If the float is jammed in the up position (down with the air horn turned over), the needle will stay in the seat and no fuel will enter the carb.



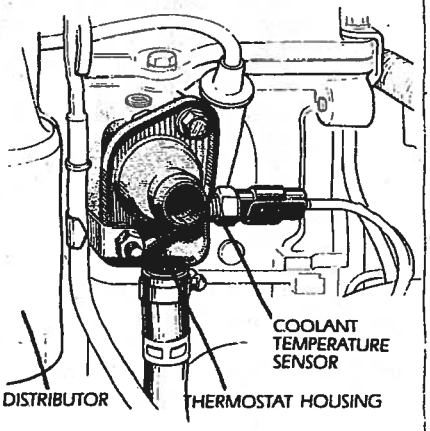
5 Invert air horn to check float height with drill bit or appropriate gauge.



7 Use the spark tester to avoid electrical shock and damaged ignition components.

Another possibility is a needle that sticks in its seat when the float drops. You can check for this by turning the air horn so that the float is facing down. The float should drop and the needle should move out of its seat. If it doesn't, it's stuck and it should be replaced. Wear has probably led to a ridge that causes the needle to stick in its seat. Replace it. Adjust float height before reinstalling the air horn (Fig. 5).

If the float bowl was full of fuel when you removed the air horn, examine the accelerator pump. On many carbs you'll find the pump hanging from the air horn. It consists of a rawhide or neoprene piston that pushes fuel through a chamber and into the accelerator pump nozzles. If the piston has deteriorated,



8 On Chrysler 2.2L engines, coolant temp sensor is in the thermostat housing.

fuel won't squirt out and starting will be difficult, if not impossible.

Some carbs have a diaphragm-type accelerator pump rather than a piston. This type pump is usually attached to the carb base with screws. Check for a torn diaphragm by removing the pump assembly (Fig. 6).

Checking for spark

Once you've determined that enough fuel for starting is available—or with port-injected engines before you check for fuel—you can perform a very simple test to see if the second element necessary for starting an engine is available: ignition spark.

In the good old days of simple cars with points and condensers, all you had to do to check for spark was pull the coil wire from the distributor tower and hold it near the ground while cranking the engine. If it sparked, you did the same thing with one of the plug cables to make sure voltage was getting past the rotor and distributor cap.

With today's high power ignitions, you could end up with a serious electrical shock or damaged ignition components if you check for spark in this manner. Nowadays you need a special spark-test tool, but the job is still an easy one. This tool is available at most auto parts stores, or any GM dealer. Ask for the ST-125 spark tester. Because spark checks are an important part of many diagnostic routines, no serious driveway mechanic should be without this tool.

To check for spark, remove one plug cable from a sparkplug with the ignition turned off. Twist the boot a little if you have to. Install the spark tester on the end of the cable and attach the clamp to a good ground. Then, while your helper cranks the engine, watch the end of the spark tester. A well-defined spark should arc from the tester's center electrode to its housing (Fig. 7).

If you see a spark, check several other cables in the same way. If they all check out okay, you can be sure that a lack of spark is not preventing the engine from starting.

If there is no spark, remove the distributor cap and make sure the rotor turns when the engine cranks. If it doesn't, the pin that secures the distributor gear to the shaft is probably broken and the distributor will have to be removed for repair. It's also possible that the camshaft timing belt or chain is broken. If the rotor turns and there is no spark, check for broken or disconnected pickup wires. If everything looks okay, further diagnosis of the electronic ignition system is necessary.

Other possible problems

If your troubleshooting finds that the engine is supplied with both fuel and spark, you'll have to look elsewhere for the starting problem.

On many fuel-injected engines, a throttle-position sensor (TPS) that sticks in the wide open throttle position will cause the computer to go into the CLEAR FLOOD mode. This results in a lean fuel mixture that makes starting difficult, if not impossible.

If the coolant sensor on a computer-controlled engine fails in such a way that its circuit opens with the ignition off, the computer will think that the outside temperature is extremely cold. In warm weather, this condition can cause flooding, which will result in a no-start (Fig. 8).

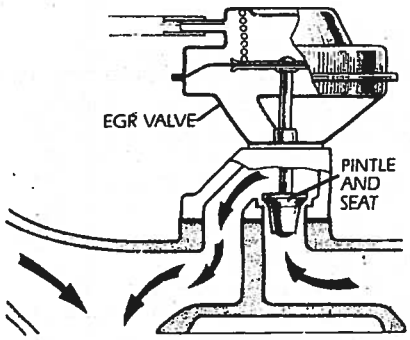
Water in fuel-system components can cause a no-start in cold weather, particularly if you get a load of gas that was blended for warm weather. The best cure is a warm-up indoors. If you have recurring trouble, add a can of gasoline winterizer.

An EGR valve that sticks open can cause an overly lean air/fuel mix during cranking, resulting in a no-start. Remove a suspect EGR valve and make sure its pintle is firmly against its valve seat (Fig. 9).

If an engine's camshaft timing chain or belt jumps one or more teeth on the gear or pulley due to wear, the engine will usually only snort and backfire when you attempt to start it.

To see if an engine has jumped time, turn the crank until the ignition timing mark on the crank pulley is aligned with the pointer on the engine, then remove the distributor cap.

The rotor should be pointing to the terminal in the distributor cap for the first cylinder in the firing order or the cylinder 180° across the cap. If not, the engine has jumped time, or—as explained earlier—the distributor's drive gear pin has sheared. **PM**



9 Remove the EGR valve to check the pintle for proper seal against seat.